Clarion
POWER SYSTEM

APX401.4

4-CHANNEL POWER AMPLIFIER

OPERATION
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MANUAL

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INTRODUCTION

The Clarion APX401.4 is a full-featured four-channel amplifier incorporating the following features:

- Full frequency response with low distortion and exceptional signal to noise performance.
- Advanced circuitry design features bridgeable and mixed mode operations for use in a variety of 4, 3 or 2 channel audio systems.
- Independent front and rear, low-pass or high-pass electronic crossovers each with a 12dB per octave slope and full adjustment range (from 55Hz to 550Hz Front and 55Hz to 5.5kHz Rear) to aid in any audio system configuration.
- Variable bass boost circuit to reinforce low frequency signals that maybe lost due to subwoofer box design.
- Adjustable input level controls with ground loop isolation, which allows a wide range of input signals.
- Remote turn-on with “soft start” muting to prevent turn-on “thump”.
- Pulse-width modulated (PWM) MOSFET power supply with low AM RFI and protection circuits for overheating and speaker shorts.
- 2 ohm load capacity to drive a variety of speaker systems.
- Gold-plated input/output connectors and an external automotive type fuse
- Aluminum heat sink for efficient heat dissipation.
- Low profile, compact size for space limited installations.

ABOUT THE MANUAL AND WARRANTY

To start enjoying your new Clarion four-channel amplifier, please read the instructions stated in this manual. Keep all instructions for future reference. Also, **save your original sales receipt as proof of purchase.**

DESCRIPTION

The Clarion APX401.4 4-channel car audio amplifier is an excellent choice for creating a variety of multi-channel sound systems. The amplifier features flexibility of 2, 3 or 4 channel system by a flip of a switch. You can also configure the front or rear amplifier sections for a mixed mode operation to drive a set of satellite speakers and/or subwoofer.

The built-in 12 dB per octave electronic crossover lets you custom tailor the sound of the front and rear channels, using two independent filters with adjustable crossover frequencies for high-pass or low-pass filtering.

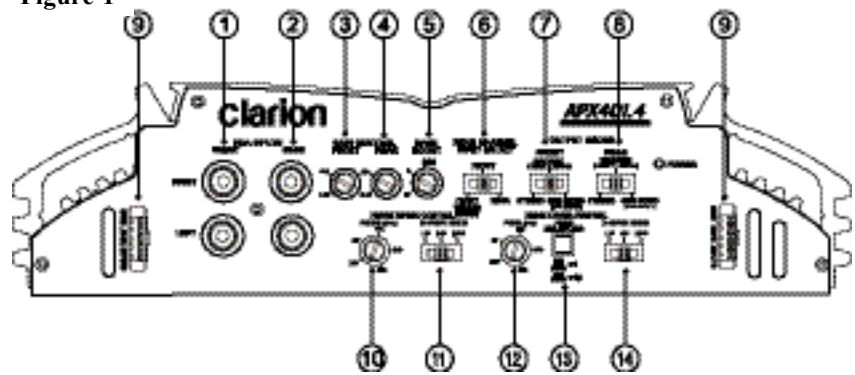
The amplifier also uses an unregulated MOSFET power supply for superior control of output wattage. A toroid-coil transformer yields maximum power transfer with minimal heat loss. Extensive circuit design keeps AM RFI at low levels, so you won't hear unwanted noise when the level is cranked up. Protection circuits safeguard the amplifier when overheating, speaker shorts, or improper load conditions occur.

All connections and controls are on the end panels and are easy to understand. Gold-plated RCA and barrier connectors are used to ensure the best electrical connection for your system. Integrated into the endpanel is an external automotive fuse that is easy to replace.

INPUT CONNECTIONS AND AUDIO CONTROL

The front panel of the APX401.4 contains connections for RCA Inputs and Audio Control as shown below.

Figure 1-



1. Front RCA Input Jacks
2. Rear RCA Input Jacks
3. Front Gain Control
4. Rear Gain Control
5. Bass Boost Control
6. Rear Channel Input Selector
7. Front Mode Switch
8. Rear Mode Switch
9. Speaker Level Inputs
10. Front Frequency Control
11. Front X-Over Mode Switch
12. Rear Frequency Control
13. Rear Multiplier Switch
14. Rear X-Over Mode Switch

The Input Connections are gold-plated RCA Jacks and are labeled as FRONT RIGHT, FRONT LEFT, REAR RIGHT and REAR LEFT. The Gain Controls provide a wide adjustment range to accommodate output levels from any brand of source unit.

• **Gain Controls** - Seperate Front and Rear Gain Controls allow you to set the nominal operating level of the amplifier. The amplifier's range, 250mV to 2.5V for RCA inputs or 500mV to 5V for speaker level inputs, can accommodate input levels from virtually any brand of source unit.

• **Bass Boost Control** - The amplifier also features a "high-Q" (i.e. narrow frequency band) Bass Boost circuit. It acts much like an equalizer, with adjustable gain (from 0 to +18dB) fixed at 45Hz. Use this feature to tune low-frequency audio response to compensate for a less than ideal subwoofer enclosure design. The added boost produces rich, full bass tones that are normally difficult to reproduce in the car audio environment. NOTE: If Bass Boost is undesired, set Bass Boost to 0dB.

High-pass/Low-pass Filter Controls

• **Freq (Hz) Controls** - The front crossover frequency is fully adjustable between 55Hz and 550Hz. The rear crossover frequency is fully adjustable between 55Hz and 5500Hz (via the Rear Crossover Frequency Multiplier) for a wider range of crossover points. Use this feature, along with your speaker manufacturer's recommended crossover frequencies, to quickly design a more advanced system. NOTE: If either of the X-Over Mode Switches is set to OFF, varying the Freq (Hz) Control will produce no effect.

• **Rear X-Over Frequency Multiplier Switch** - When engaged, this switch increases the crossover frequency of the rear channels by a factor of 10. Example: If the Freq (Hz) dial is set for 240Hz, pushing in the multiplier Switch changes the setting to 2400Hz.

• **X-Over Mode Switches** - These switches are equipped with 12dB per octave electronic filters for precise frequency attenuation with minimal phase distortion. Each filter is activated by sliding the X-Over Mode Switch to either LP or HP.

• **Output Mode Switches** - These switches allow you to set the output mode for front and rear channels. Stereo output allows full left and right stereo operation. Bridged Mode uses a single input (Right In) to produce a bridged output that is useful in high powered systems. L + R (sum mono) allows a stereo input to be summed into a mono output.

• **Rear Channel Input Select -** This switch allows the flexibility of using either 2 or 4 inputs to operate the amplifier.

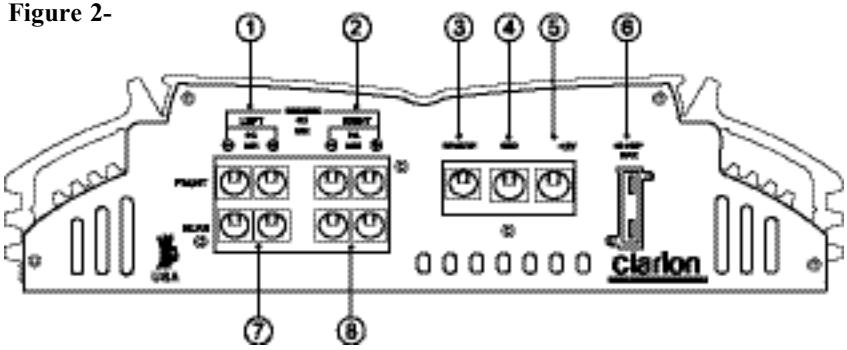
• **Speaker Level Inputs** - These provide connections for a high-level stereo source. These connections are provided for installations when the source unit does not have RCA outputs.

WARNING: When using the speaker (high-level) inputs, the Black wire must be grounded at the radio. Failure to do this will result in noise and/or improper operation.

CONNECTIONS FOR POWER AND SPEAKERS

The rear panel of the APX401.4 contains power and speaker connections as shown below.

Figure 2-



1. Left Front Speaker Output
2. Right Front Speaker Output
3. Remote Turn-on Input
4. Ground Input
5. Battery + 12v Input
6. 40 Amp Fuse
7. Left Rear Speaker Output
8. Right Rear Speaker Output

APPLICATIONS

The Clarion APX401.4 4-channel car audio amplifier can be used in a variety of system applications. Here are some examples to help plan your own installation.

4-Channel Full-Range Stereo System

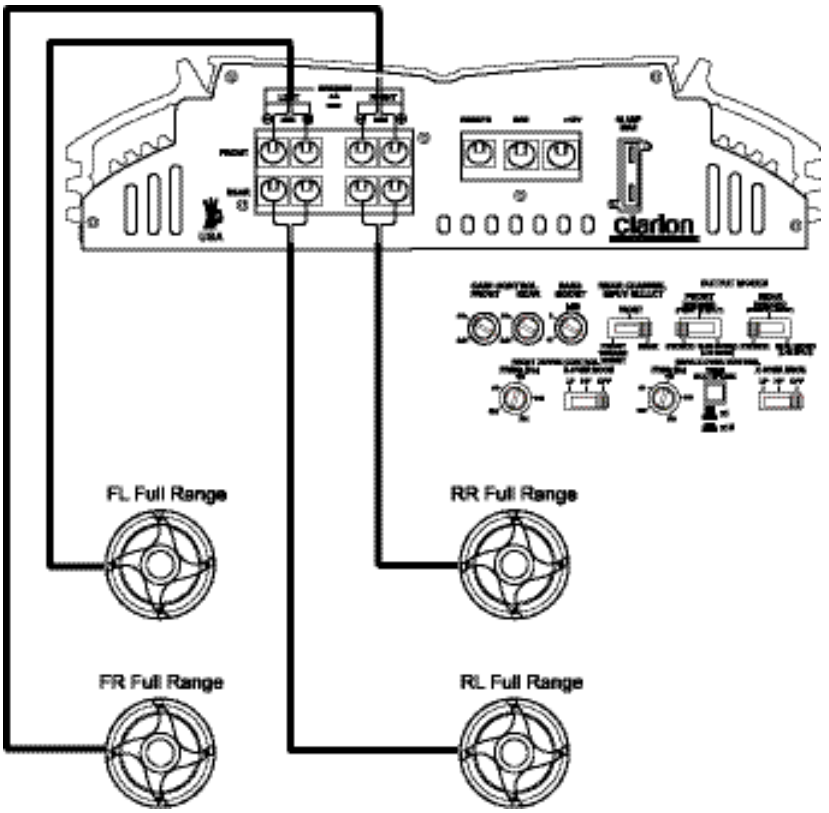


Figure 3 - In this application, the APX401.4 is used as a 4-channel amplifier to drive four full-range speakers in stereo.

4-Channel Stereo System
2-Channel High-Pass, 2-Channel Low-Pass

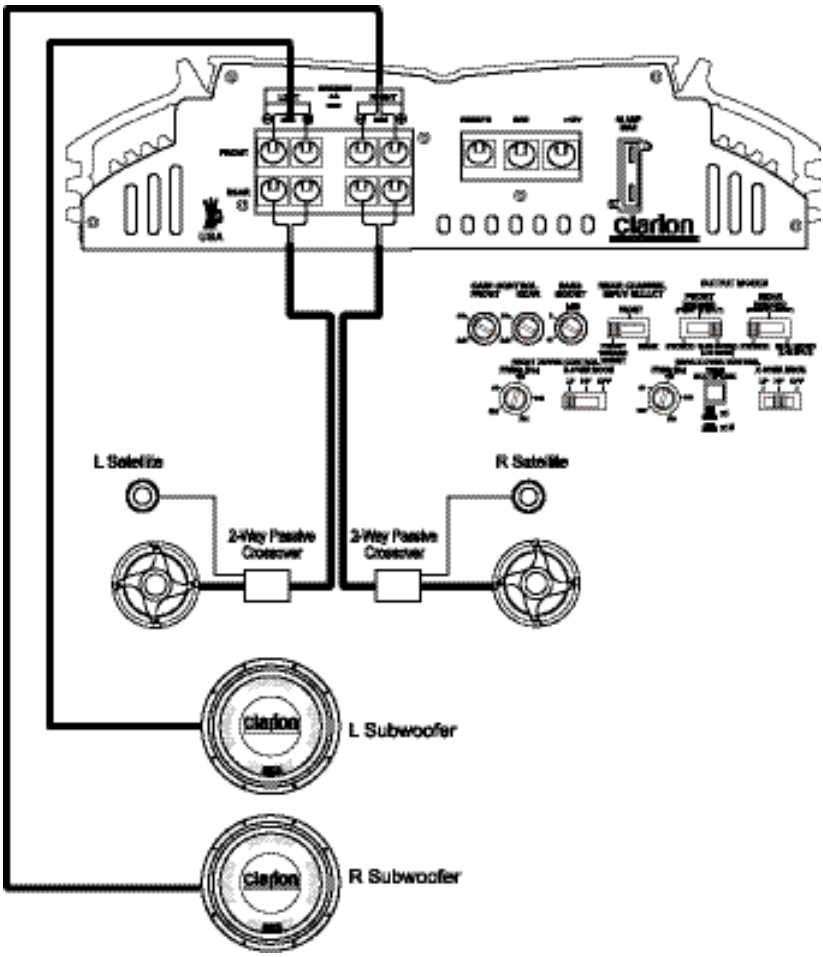


Figure 4 - In this 4-channel system, the APX401.4 drives a pair of stereo satellites for the front and a pair of subwoofers for the rear.
Note the filter settings.

2-Channel Stereo System with Low-Pass Bridged Mono Channel

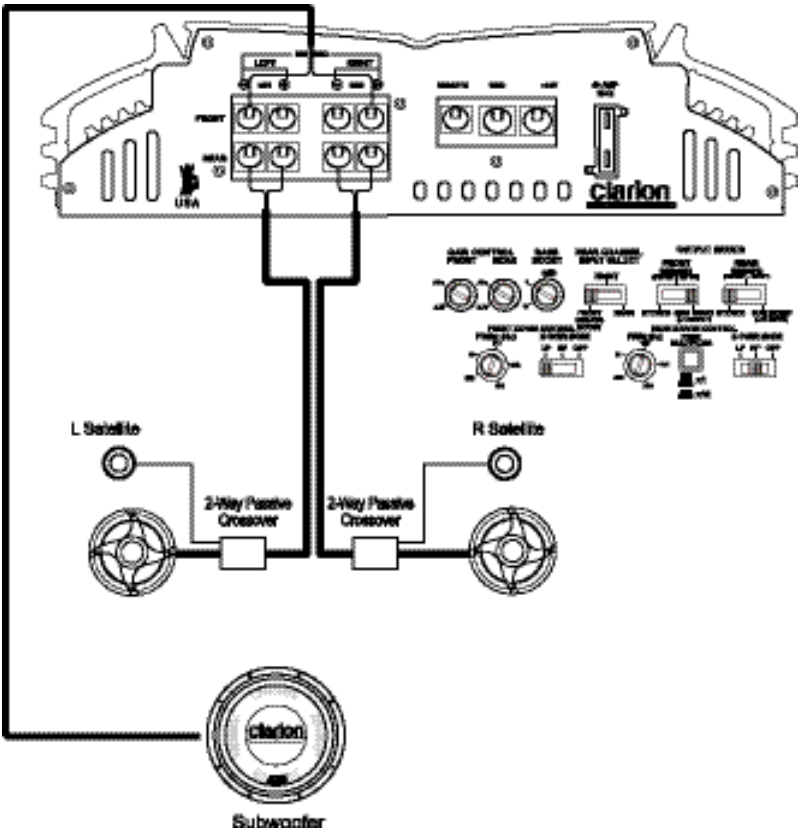


Figure 5 - The APX401.4 can also be used to drive a pair of stereo satellites for the front and a single mono subwoofer for the rear. Note the filter settings.

2-Channel High Power System
(Satellite or Subwoofer)

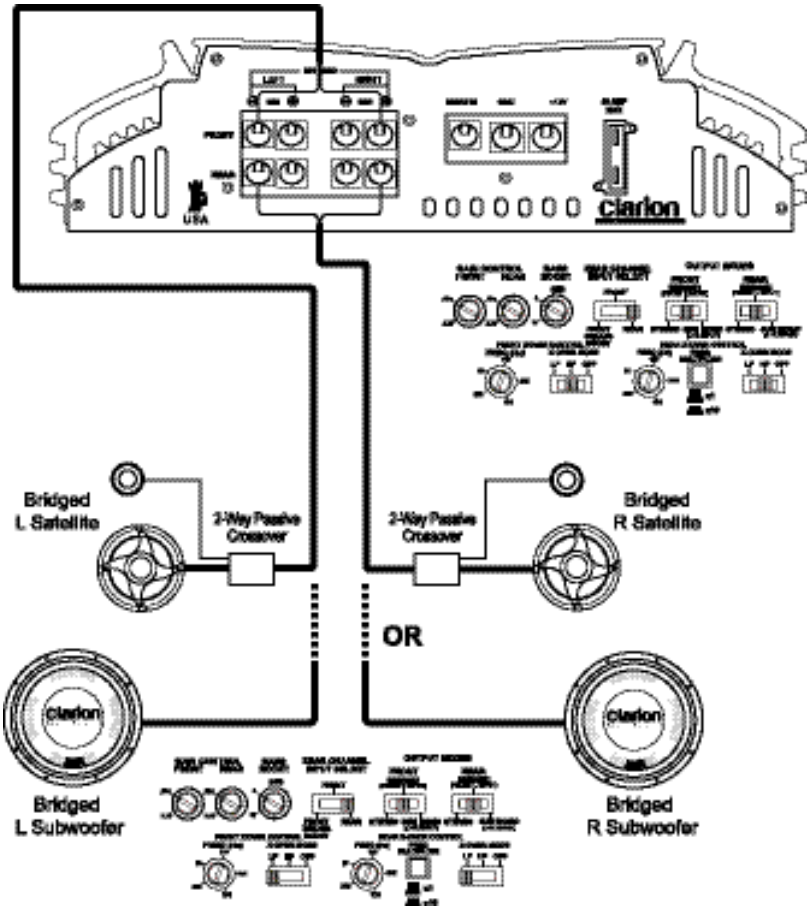
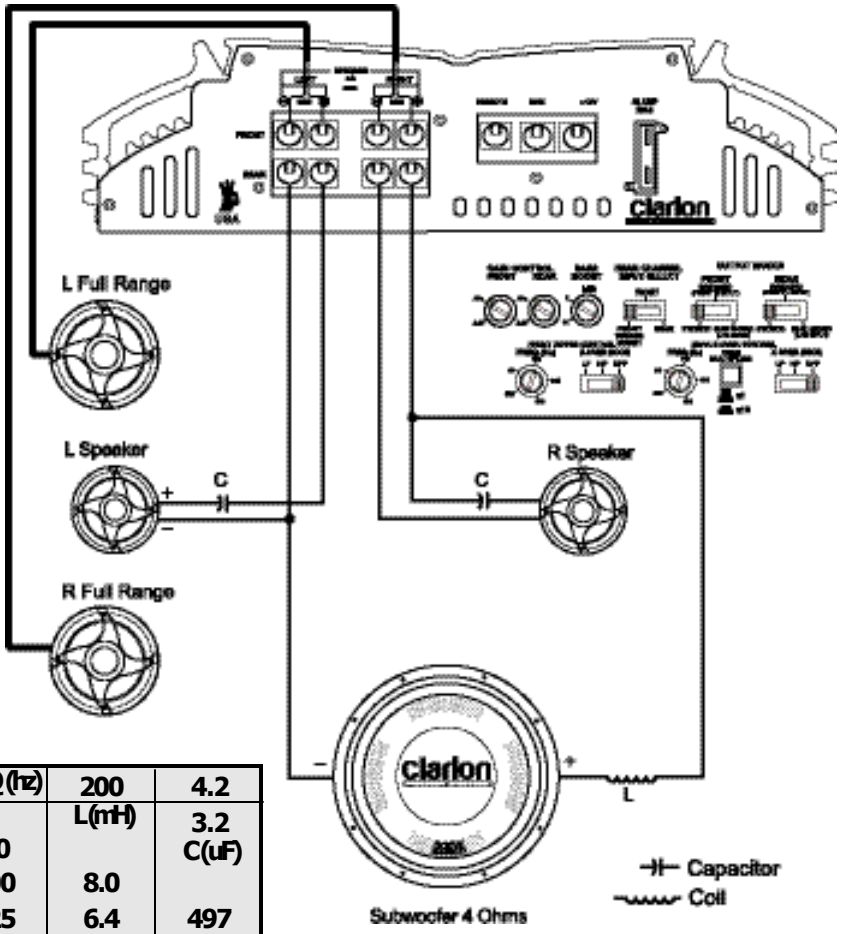


Figure 6 - The APX401.4 can be set up as a 2-channel high-power amplifier to drive a pair of satellites (or subwoofers).

Mixed-Mode System On Rear; Full-Range Speakers On Front



FREQ (hz)	200	4.2
	L(mH)	3.2
80		C(uF)
100	8.0	
125	6.4	497
150	5.1	398

NOTE: Chart values based on 4 ohm speakers.

Figure 7 - The amplifier can be configured for a mixed-mode operation on either channels 1/2 or 3/4 amplifier sections. The table provides component values to create a 6dB per octave crossover at specified frequencies. Use components that have a ± 5% tolerance and capacitors rated at 100V. NOTE: Choose the same frequency for both LP and HP crossovers. Do not overlap frequencies, as this may damage the amplifier.

INSTALLATION

This section lists Mounting and Wiring Precautions prior to installing the Clarion APX401.4. These safeguards provide enough detail to complete an installation successfully. If you do not have the necessary skills, do not attempt to install the amplifier yourself. Instead, see your authorized Clarion dealer for installation recommendations.

MOUNTING PRECAUTIONS

Although the Clarion APX401.4 incorporates heat sinks and protection circuits, mounting the amplifier in a tight space without any air movement can still damage internal circuitry over time. Choose a site that provides adequate ventilation around the amplifier. For easy system set-up, mount the amplifier so the front panel controls can be accessible after installation.
In addition, observe the following precautions:

1. For the most efficient cooling, mount the amplifier so cool air runs along the length of the fins rather than across them. Remember, any moving air will dissipate heat.

2. Mount the amplifier on a rigid surface. Avoid mounting to subwoofer enclosures or areas prone to vibration. Do not install the amplifier on plastic or other combustible materials.

3. Prior to drilling, make sure proposed mounting holes will not cut into the fuel tank, fuel lines, brake lines (under chassis), or electrical wiring.

WIRING PRECAUTIONS

Read all wiring precautions. If you are not sure of the connections, contact your authorized Clarion dealer.
1. Before installation, make sure the source unit Power switch is in the OFF position.

2. Disconnect the negative (-) lead of the battery before making any power connections.

3. When making connections, be sure that each connection is clean and secure. Insulate final connections with electrical tape or shrink tubing. Failure to do so may damage your equipment.

4. A secure, clean ground connection is critical to the performance of your Clarion amplifier. Use the shortest ground wire possible and securely connect to the car chassis to minimize resistance and avoid noise problems. Be sure to clean off any paint, prior to making this connection.

5. Add an external fuse on the amplifier's positive (+) power lead and connect it as close as possible to the vehicle's (+) battery terminal. Use a fuse rated to the total current consumption of the amplifier(s). Adding an external fuse will protect the electrical system from short circuits that can cause a fire.

6. Refer to the Figure 8 when making electrical connections. Connect the amplifier's positive (+) lead via a fuse directly to the positive (+) terminal on the battery. Do not connect this wire to the car's fuse panel. Use red-insulated 10-gauge (or larger) wire for the amplifier's positive (+) power lead and the same-gauge black insulated wire for the ground.

7. When replacing the amplifier's fuse, always use one having the same current rating. Substituting a higher-rated fuse or a slow-blow type can result in serious damage to the amplifier.

8. Never ground the speakers to the vehicle chassis or body.

9. Make sure that your vehicle's electrical system (alternator, battery, etc.) is capable of handling the additional load. If you are planning a multi-amplifier system, you may need to add a second battery and possibly upgrade the alternator with a higher-output rated model. Consult your authorized Clarion dealer for recommendations.

10. To avoid noise problems, run the amplifier's positive (+) power lead along one side of the vehicle from the battery. Run the remote turn-on wire and RCA audio cables down the center, and route the speaker wires along the remaining side. If wires must cross, run them perpendicular to each other.

11. When creating passage holes for the power wire, use grommets to eliminate any sharp edges created during drilling. This will protect the wire from being nicked and causing a short circuit.

12. Excess cable can cause signal loss and act as an "antenna" for noise. Use only high-quality RCA cables that are no longer than necessary to make a direct connection with the source unit or equalizer.

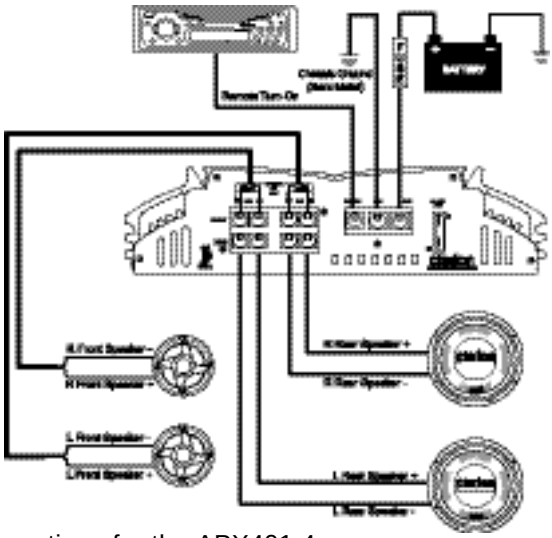


Figure 8 - Electrical connections for the APX401.4

SETTING THE GAIN

After completing the installation, follow these steps to set the Gain Control and then perform the Final System Checks.

1. Turn the Gain Control all the way counter-clockwise.

2. Turn the vehicle's Ignition Switch to the ON position. Then turn the ON/OFF Switch on the source units to the ON position. Set all Tone or Equalization Controls to "flat" positions and turn Loudness off.

3. Play a CD or Tape and set the Volume Control at 75% of full level.
NOTE: If the system uses an equalizer, set its frequency controls to "flat" positions.

4. Slowly increase the Gain Control. Stop when you hear a slight distortion of audio.

SETTING THE CROSSOVER

The Clarion APX401.4 features fully adjustable front and rear crossovers. To set the crossovers, follow these steps.

1. Using the X-Over Mode Switch, select the desired mode: LP for Low Pass, HP for High Pass or OFF for Full Range.

2. Using the Freq (Hz) Selection Control, select the desired frequency. If the desired frequency exceeds the range of the Freq (Hz) Selection Control, press the Crossover Frequency Multiplier Switch to increase the value by a multiplier of 10.
• For example, 55Hz x 10 = 550Hz or 550Hz x 10 = 5.5kHz.

3. Repeat steps 1 and 2 for both the front and rear crossovers.

SETTING THE BASS BOOST

1. Initially set the Bass Boost control to its full left position (i.e. 0dB).

2. Listen to a variety of music styles (e.g. Rock, Rap, etc.) and slowly increase the Bass Boost control until a noticeable increase in low bass response is perceived.

3. Slowly adjust the Bass Boost control (up or down) to realize the best bass response.

CAUTION: If you hear a "pop" (due to speaker over-excursion), lower the Bass Boost to prevent speaker damage. If the system sounds muddy and distorted (due to amplifier clipping), lower Bass Boost to avoid shutdown from overheating.

FINAL SYSTEM CHECKS

1. Start the engine and turn on the source unit. After a two-second delay, slowly increase the Volume Control and listen to the audio. If you hear any noise, static, distortion or no sound at all, check the connections, and also refer to Troubleshooting. Depending on your system design, the levels may become quite loud even at low Volume Control settings. Until you get an "audio feel" of the system's power, use care when adjusting controls.

2. Turn the Balance Controls to their extreme positions and listen to the results. Audio output should match control settings (audio from the left speaker when balance is left).

3. Increase the volume and verify that the amplifier reproduces audio (at full frequencies) without distortion. If you hear distortion, check the connections and verify that the Gain Control is set correctly. Another possibility is damaged speakers or under-powered speakers. Once again refer to Troubleshooting for additional help.

TROUBLESHOOTING

Problem
No Audio.
Solution
Low or no remote turn-on voltage. Check remote connections at amplifier and source unit.

Blown amplifier fuse. Replace with new fast-blow fuse (same rating).

Power wires not connected. Check battery and ground wiring at amplifier; also check battery connections.

Speaker leads shorted. Check speaker continuity to ground, it should not show a common ground.

Speakers not connected or are blown. Check speaker connections at amplifier, measure coil impedance.

Problem
Audio cycles on and off.
Solution
Thermal protection circuits are shutting amplifier off. Check location for adequate ventilation; consult an authorized Clarion Audio Dealer.

Problem
Distorted audio.
Solution
Gain is not set properly, or damaged speaker cones. Review Setting Gain; inspect each speaker cone for signs of damage (i.e. frozen cone, burning smell, etc.)

Problem
Amplifier fuse keeps blowing.
Solution
Incorrect wiring or short circuit. Review Installation and check all wiring connections.

Problem
Whining or ticking noise in the audio with engine on.
Solution
Amplifier is picking up alternator noise or radiated noise. Turn down input gain; move audio cables away from power wires. Check power and ground connections on amplifier; install an in-line noise filter on source unit's power wire; check alternator and/or voltage regulator; test for weak battery or add water to battery.

PRODUCT SPECS

Frequency Response	20Hz ~ 20kHz
Signal Noise Ratio	>95db
THD	.05% all channels driven
Input Sensitivity Low Level	250mV ~ 2.5V
Input Sensitivity Speaker Level	500mV ~ 5V
Max. Power Output	380w (190 x 2)
Cont. Power Output	200w (50w x4) @.08% THD
2-Ohm Stereo Output	90 x 4 @ .8% THD
Bridged Power	190 x 2 @ .8% THD
Dimensions	2 1/8" H x 8 1/4" W x 12" L
Current Consumption @ Max Power Output	46A @ 380 Watts

WARRANTY INFORMATION

This product is warranted against all defects in material workmanship for a period of one year from the date of original purchase. Clarion ProAudio products except for speakers are covered by a two year warranty when installed by an authorized Clarion dealer. The conditions of this warranty and the extent of responsibility of Clarion Corporation under this warranty are as follows:

1. PROOF OF DATE OF PURCHASE WILL BE REQUIRED FOR WARRANTY SERVICE OF THIS PRODUCT. IN CASE OF 2 YEAR WARRANTY FOR CLARION PROAUDIO PRODUCT, PROOF OF INSTALLATION BY AUTHORIZED DEALER IS REQUIRED. INFORMATION ABOUT CLARION AUTHORIZED WARRANTY SERVICE CENTERS MAY BE OBTAINED BY CONTACTING OR WRITING CLARION CORPORATION AT THE ADDRESS LISTED BELOW.

2. This warranty will become void if service performed by anyone other than an approved Clarion Warranty Service Center results in damage to product.

3. This warranty does not apply to any product which has been subject to misuse, neglect or accident, or which has had the serial number altered, defaced or removed, or which has been connected, installed, adjusted or repaired, other than in accordance with the instructions furnished by Clarion Corporation.

4. This warranty does not cover car static or other electrical interferences, tape head cleaning or adjustments, or labor costs for the removal or reinstallation of the unit for repair.

5. The sole responsibility of Clarion Corporation under this Warranty shall be limited to the repair or replacement thereof, at the sole discretion of Clarion Corporation.
6. If it becomes necessary to send the product or any defective part to Clarion Corporation or an authorized warranty service station, the product must be shipped in its original carton or equivalent carton, fully insured, with shipping charges prepaid. Clarion Corporation will not assume any responsibility for any loss or damage incurred in shipping.

7. ALL IMPLIED WARRANTIES EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW SHALL HAVE NO GREATER DURATION THAN THE WARRANTY PERIOD SET FORTH ABOVE. UNDER NO CIRCUMSTANCES SHALL CLARION CORPORATION BE LIABLE FOR ANY LOSS OR DAMAGE, DIRECT OR CONSEQUENTIAL, ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT. BECAUSE SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS OR EXCLUSIONS OR LIMITATIONS OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU.

8. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

9. For instructions on how to obtain warranty service, please call 1-800-GO-CLARION or visit our web site at www.clarion.com for a listing of Authorized Warranty Service Centers in your area, or contact the Clarion Customer Service Manager at the address listed below:

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